CLAIMS

What is claimed is:

1. An antenna assembly, comprising:

multiple active antenna elements; and

at least one beam control antenna element electromagnetically coupled to a subset of the active antenna elements and electromagnetically disposed between at least two of said active antenna elements.

2. The antenna assembly according to Claim 1 further including at least one device operatively coupled to said at least one beam control antenna element to effect at least one antenna beam pattern formed by the antenna assembly.

3. The antenna assembly according to claim 2 wherein said at least one device is operatively coupled to said at least one beam control antenna element to affect the electromagnetic coupling between at least two of the active antenna elements.

4. The antenna assembly according to claim 2 wherein said at least one device provides at least two modes of operation for the antenna assembly.

5. The antenna assembly according to claim 4 wherein said at least two modes include a non-omnidirectional mode and a substantially omni-directional mode.

6. The antenna assembly according to claim 4 wherein said at least two modes reduces electromagnetic coupling by respective amounts between at least a subset of the active antenna elements.

7. The antenna assembly according to Claim 1 wherein the beam control antenna element is directly attached to ground or connected to ground through a reactance.

8. The antenna assembly according to claim 4 wherein said at least one device includes a switch.

9. The antenna assembly according to claim 8 wherein the switch includes a number of switch states and a like number of reactance elements coupled to the switch.

10. The antenna assembly according to claim 1 wherein the spacing between the active antenna elements is about half of the wavelength of a carrier signal transmitted or received by the active antenna elements.

11. The antenna assembly according to claim 1 wherein the spacing between the active antenna elements and beam control antenna elements is about one-quarter of the wavelength of a carrier signal transmitted or received by the active antenna elements.

12. The antenna assembly according to claim 2 further including a processor coupled to the active antenna elements and said at least one device, the logic used to select state settings for said at least one device based on a signal received by the active antenna elements.

13. The antenna assembly according to claim 1 wherein the active antenna elements are arranged in a one-dimensional array or curvilinear array.

14. The antenna assembly according to claim 1 wherein the active antenna

elements are arranged in a 2-dimensional array.

15. The antenna assembly according to claim 14 wherein the 2-dimensional array is substantially a circular pattern.

16. The antenna assembly according to claim 1 including multiple beam control antenna elements, wherein the beam control antenna elements are arranged in a 1-dimensional array.

17. The antenna assembly according to claim 1 including multiple beam control antenna elements, wherein the beam control antenna elements are arranged in a 2-dimensional array.

18. The antenna assembly according to claim 1 further including a multiple-input multiple-output (MIMO) processing unit having multiple transmitters or receivers adapted to operate with the multiple active antenna elements.

19. The antenna assembly according to claim 1 used in a base station, hand set, wireless access point, or client or station device.

20. The antenna assembly according to claim 1 used in a cellular network, Wireless Local Area Networks (WLAN), Time Division Multiple Access (TDMA) system, Code Division Multiple Access (CDMA) system, or GSM system.

21. A method for supporting RF communications, comprising:

forming at least one antenna beam pattern by multiple active antenna elements; and

affecting the at least one antenna beam pattern by at least one beam control antenna element electromagnetically coupled to and electromagnetically disposed between at least two of the active antenna elements.

22. The method according to Claim 21 further including adjusting a reactance of said at least one beam control antenna element to effect the at least one antenna beam pattern formed by the active antenna elements.

23. The method according to claim 22 wherein adjusting the reactance of said at least one beam control antenna element affects electromagnetic coupling between at least two active antenna elements.

24. The method according to claim 22 wherein adjusting the reactance of said at least one beam control antenna element provides at least two modes of operation.

25. The method according to claim 24 wherein the two modes of operation include a non-omnidirectional mode and a substantially omni-directional mode.

26. The method according to claim 25 wherein said at least two modes reduces electromagnetic coupling by respective amounts between at least a subset of the active antenna elements.

27. The method according to claim 21 wherein the beam control antenna element is directly attached to ground or connected to ground through a reactance.

28. The method according to claim 24 wherein providing at least two modes of operation includes operating a device coupled to said at least one beam control antenna element.

29. The method according to claim 28 wherein operating the device includes selectably coupling at least one reactance element to said at least one beam control antenna element.

30. The method according to claim 21 wherein the spacing between the active antenna elements is less than about half of the wavelength of a carrier signal transmitted or received by the active antenna elements.

31. The method according to claim 30 wherein the spacing between the active antenna elements and beam control antenna elements is about one-quarter of the wavelength of a carrier signal transmitted or received by the active antenna elements.

32. The method according to claim 22 wherein adjusting the reactance of said at least one beam control antenna element includes processing a signal received by the active antenna elements to adjust the reactance.

33. The method according to claim 21 further including operating the active antenna elements in a one-dimensional array or curvi-linear array.

34. The method according to claim 21 further including operating the active antenna elements in a two-dimensional array.

35. The method according to claim 34 wherein the 2-dimensional array is substantially a circular pattern.

36. The method according to claim 21 wherein the multiple beam control antenna elements are arranged in a 1-dimensional array.

37. The method according to claim 21 wherein the multiple beam control antenna elements are arranged in a 2-dimensional array.

38. The method according to claim 21 further including passing RF signals between the active antenna elements and a Multiple-Input, Multiple-Output (MIMO) processing unit having multiple transmitters or receivers adapted to operate with the active antenna elements.

39. The method according to claim 21 used in a base station, hand set, wireless access point, or client or station device.

40. The method according to claim 21 used in a cellular network, Wireless Local Area Network (WLAN), Time Division Multiple Access (TDMA) system, Code Division Multiple Access (CDMA) system, or GSM network.

41. An antenna assembly, comprising:

multiple active antenna elements; and

beam control means for affecting at least one antenna beam pattern formed by the multiple active antenna elements, the beam control means electromagnetically coupled to and electromagnetically disposed between at least two of the active antenna elements.

42. An antenna assembly, comprising:

multiple active antenna elements;

at least one beam control antenna element electromagnetically coupled to the active antenna elements and electromagnetically disposed between at least two of the active antenna elements; and

means for adjusting a reactance of said at least one passive antenna element to effect at least one antenna beam pattern formed by the antenna assembly.

5